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EXAMINER	
PARSONS, THOMAS H	

ART UNIT	PAPER NUMBER
1745	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/987,232	BELL, LON E.	
	Examiner	Art Unit	
	Thomas H Parsons	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 October 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,13-15,17-25,32-40,43 and 44* is/are rejected.

7)☒ Claim(s) *10-12,16,26-31,41 and 42* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 October 2002* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Response to Amendment

This is in response to the Applicant's Response filed 22 August 2203. Because the substituted specification, drawings, and claims filed 15 October 2002 (paper no. 5) were incorrectly matched with the instant application, the previous office action addresses issues not related to the instant case. Accordingly, the previous office action has been withdrawn is indicated below.

Drawings

1. The objection to Figure 1A for lacking a legend such as --Prior Art-- because only that which is old is illustrated has been **withdrawn** for reasons as set forth above.

Specification

2. The objection to the disclosure because of informalities has been **withdrawn** for reasons as set forth above.

3. The objection to the title for not being descriptive has been **withdrawn** for reasons as set forth above.

Claim Objections

4. The objection to claims 17 and 23 because of informalities has been **withdrawn** for reasons as set forth above.

Claim Rejections - 35 USC § 103

5. The rejection of claims 1-17, 20-38 under 35 U.S.C. 103(a) as being unpatentable over Ghoshal (5,867,990), and further in view of Rich (3,006,979) has been **withdrawn** for reasons as set forth above.

6. The rejection of claims 17 and 34 under 35 U.S.C. 103(a) as being unpatentable over Goshal, and further in view of Rich as applied to claims 1 and 23 above, and further in view of Corry has been **withdrawn** for reasons as set forth above.

DETAILED ACTION

The following is in response to the specification, claims and drawing filed on 15 October 2002.

Specification

7. The disclosure is objected to because of the following informalities:

Pages 1-12, "heterostructures" as mentioned on page 1, line 8 or "hetrostructures" as mentioned on page 1, line 13? Which is the correct spelling or term? Suggest changing throughout as appropriate. The Examiner suggest using "heterostructure".

Page 1, line 4, after "Application No." suggest inserting --60/331,021--.

Page 2, line 20, suggest changing "meant" to --mean--;

Page 7, line 10, suggest changing "2062" to --206--.

Appropriate correction is required.

Drawings

8. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: "204" as included on Figure 2B. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

9. Claims 1, 3, 6, 10, 13-14, 16-17, and 33-35 are objected to because of the following informalities:

In each of the claims, suggest changing "Hetrostructure" to be consistent with the spelling or term selected above in paragraph 7.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 1-5, 13-15, 17, and 34-44 rejected under 35 U.S.C. 102(b) as being anticipated by Harman (5,900,071) as further evidenced by Ralston et al. (4,731,338) and Fuschetti (5,429,680).

Claim 1: Harman in Figures 1-4 discloses a thermoelectric element (41 or 42) comprising: at least two heterostructure thermoelectric portions (20) of the same conductivity type (n-type); and an electrically conductive material coupled to the thermoelectric portions (Figure 4 shows a structure, unlabeled, coupled to elements 30) (col. 9: 14-col. 10: 11).

Ralston et al. is disclosed to show that the superlattice of Harman would inherently provide a heterostructure. Ralston et al. discloses that the superlattice having the same structure as that disclosed by Harman is a heterostructure superlattice (col. 1: 13-30).

Fuschetti is cited to show that the "an electrically conductive material" not explicitly disclosed in the reference is inherent. Fuschetti in Figure 1 discloses copper busses or conductors 17, 18 and 19 (i.e. electrically conductive material) coupled to thermoelectric portions 15 and 16 (col. 1: 15-51).

Claim 2: The rejection is as set forth in claim 1 as further evidenced by Fuschetti wherein the wherein the electrically conductive material (not labeled) comprises at least one electrode.

Claim 3: The rejection is as set forth above as further evidenced by Ralston et al. wherein Harman in Figure 4 shows that heterostructure thermoelectric portions (20) form layers.

Claim 4: The rejection is as set forth above in claim 1 as evidenced by Fuschetti wherein Harman in figure 4 shows an electrically conductive material coupled to the layers at at least one end of the layers (Harman in Figure 4 shows a structure, not labeled, coupled to both ends of the layers 20).

Claim 5: The rejection is as set forth above in claim 1 as evidenced by Fuschetti wherein Harman in Figure 4 shows an electrically conductive material (unlabeled structure) coupled to the top and bottom of the layers (20).

Claim 13: Harman in Figure 4 discloses an intermediate material (solder joint 22) between at least one hetrostructure thermoelectric portion and the at least one electrode (col. 9: 43-62).

Claim 14: As set forth above in claim 13, Harman discloses an intermediate material that is structurally the same as that instantly disclose, and therefore, anticipates an intermediate material configured to reduce shear stress in the hetrostructure thermoelectric portions when the thermoelectric element is operated.

Claim 15: As set forth above in claim 13, Harman discloses an intermediate material that is structurally the same as that instantly disclose, and therefore, anticipates a resilient intermediate material.

Claim 17: Harman in Figure 4 discloses at least one of the hetrostructure thermoelectric portions (20) comprises at least two layers of hetrostructure thermoelectric material (col. 9: 14-col. 10: 11).

Claim 34: The rejection is as set forth above in claim 1 wherein Harman in Figure 4 discloses a method of producing a thermoelectric device (40) comprising the steps of: layering (stacking) at least two hetrostructure thermoelectric segments (20) and connecting at least one electrode (unlabeled structure coupled to segments 20 via solder 22) to the segments (col. 9: 14-col. 10: 11).

Claim 35: The rejection is as set forth above in claim 1 wherein Harman in Figure 4 discloses that the step of layering (stacking) comprises bonding at least two hetrostructure thermoelectric segments with a bonding material. Harman on col. 9: 50 discloses "...followed by stacking and bonding..." which reads on a bonding material (col. 9: 14-col. 10: 11).

Claim 36: The rejection is as set forth above in claim 13 wherein Harman discloses further comprising the step of providing an intermediate material (solder joint 22) between at least one of the at least two hetrostructure thermoelectric segments and the at least one electrode.

Claim 37: Harman discloses that the bonding and intermediate materials are configured to decrease power density as the materials of Harman are structurally the same as those instantly disclosed.

Claim 38: The rejection is as set forth above in claim 1 wherein Harman in Figure 4 discloses that the step of connecting comprises connecting electrodes (unlabeled structures coupled to elements 20 via solder joint 20) at the ends of the segments (col. 9: 14-col. 10: 11).

Claim 39: The rejection is as set forth above in claim 1 wherein Harman in Figure 4 discloses that the step of connecting comprises connecting electrodes at the top and bottom of the segments (col. 9: 14-col. 10: 11).

Claim 40: Harman in Figures 1-4 discloses method of producing a thermoelectric device (40) comprising the steps of: forming at least two layers (20) of substantially the same thermoelectric material; and connecting at least one electrode to at least one of the layers (col. 9: 14-col. 10: 11).

Claim 43: Harman in Figure 4 discloses connecting electrodes (unlabeled structure shown as coupled the elements 20 via solder 22) at the ends of the layers.

Claim 44: Harman in Figure 4 discloses connecting electrodes (unlabeled structure shown as coupled the elements 20 via solder 22) at the top and bottoms of layers 20

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claims 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harman as applied to claim 1 above, and further in view of Applicant's Background section.

Harman is as applied, argued and disclosed above, and incorporated herein.

Claim 6: Harman does not disclose heterostructure thermoelectric wires.

The Applicant in the Background section of the instant application (page 1, line 27 through page 2, line 6 discloses that hetrostructure thermoelectric portions form wires.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted the hetrostructure thermoelectric portions with the hetrostructure thermoelectric portions of the Applicant's Background section because the Applicant discloses known heterostructure wires that would have achieved desired performance of thermoelectric portions thereby improving the overall performance of thermoelectric devices and providing coat advantages due to improved performance.

Claim 7: The rejection is as set forth above in claim 2 wherein the electrically conductive material comprises at least one electrode.

Claim 8: The rejection is as set forth above in claim 4 wherein the electrically conductive material is coupled to the wires at at least one end of the wires.

Claim 9: The rejection is as set forth above in claim 5 wherein the electrically conductive material is coupled to at least the top or bottom of the wires.

Claim Rejections - 35 USC § 102

14. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

15. Claims 18-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Hoon et al. (6,319,744).

Claim 18: Hoon et al. in Figures 4 and 12 disclose a thermoelectric element (14) comprising: at least two layers (12) of substantially the same thermoelectric material and of the same conductivity type (n- or p-type); and at least one electrically conductive material (terminal 38) coupled to the thermoelectric material (col. 6: 39-col. 7: 17; col. 8: 34-39; and col. 10: 42-58).

Claim 19: Hoon et al. in Figure 12 disclose an electrically conductive material comprising at least one electrode (terminals 38)(col. 10: 42-58).

Claim 20: Hoon et al. in Figure 12 disclose an electrically conductive material comprising coupled to the layers at at least one end of the layers (col. 10: 42-58).

Claim 21: Hoon et al. in Figure 12 disclose an electrically conductive material comprising coupled to at least the top or bottom of the layers (col. 10: 42-58).

Claim Rejections - 35 USC § 103

16. Claims 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoon et al. as applied to claim 18 above, and further in view of Applicant's Background section.

Hoon et al. are as applied, argued and disclosed above, and incorporated herein.

Claim 22: Hoon et al. do not disclose heterostructure thermoelectric wires.

The Applicant in the Background section of the instant application (page 1, line 27 through page 2, line 6 discloses that hetrostructure thermoelectric portions form wires.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted the hetrostructure thermoelectric portions with the hetrostructure thermoelectric portions of the Applicant's Background section because the Applicant discloses known heterostructure wires that would have achieved desired performance of thermoelectric portions thereby improving the overall performance of thermoelectric devices and providing coat advantages due to improved performance.

Claim 23: The rejection is as set forth above in claim 19 wherein the electrically conductive material comprises at least one electrode.

Claim 24: The rejection is as set forth above in claim 20 wherein the electrically conductive material is coupled to the wires at at least one end of the wires.

Claim 25: The rejection is as set forth above in claim 21 wherein the electrically conductive material is coupled to at least the top or bottom of the wires.

17. Claims 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoon et al. as applied to claim 18 above, and further in view of Harman.

Hoon et al. are as applied, argued, and disclosed above, and incorporated above,

Hoon et al. do not disclose heterostructures.

Harman et al. in Figures 1-4 discloses a thermoelectric element (41) wherein at least two layers are heterostructures (superlattice), and wherein at least one of the heterostructures comprises at least two layers of heterostructure thermoelectric material (col. 9: 14-col. 10: 11).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have substituted the thermoelectric element with the thermoelectric element of Harman because Harman teach heterostructures that would have provided thermoelectric materials having an enhanced figure of merit thereby improving the overall performance of the thermoelectric device.

Allowable Subject Matter

18. Claims 10-12, 16, 26-31 and 41-42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas H Parsons whose telephone number is (703) 306-9072. The examiner can normally be reached on M-F (7:00-4:30) First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on (703) 308-2383. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Thomas H Parsons
Examiner
Art Unit 1745

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Patrick Ryan
Supervisory Patent Examiner
Technology Center 1700